SA HealthPlus: A Controlled Trial of a Statewide Application of a Generic Model of Chronic Illness Care

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SA HealthPlus, one of nine national Australian coordinated care trials, addressed chronic illness care by testing whether coordinated care would improve health outcomes at the cost of usual care. SA HealthPlus compared a generic model of coordinated care for 3,115 intervention patients with the usual care for 1,488 controls. Service coordinators and the behavioral and care-planning approach were new. The health status (SF-36) in six of eight projects improved, and those patients who had been hospitalized in the year immediately preceding the trial were the most likely to save on costs. A mid-trial review found that health benefits from coordinated care depended more on patients' self-management than the severity of their illness, a factor leading to the Flinders Model of Self-Management Support.

Keywords: Chronic disease, coordinated care, care plan, self-management, health outcomes.

In Australia, the coordination of care for patients with multiple service needs may be hampered by mixed

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funding sources and the lack of integrated systems of care. Each of the commonwealth, state, and territory governments funds public health services: the commonwealth government administers the taxpayer-funded Medicare program to provide universal access to public health services by reimbursing general practitioners (GPs) and specialists on a fee-for-service basis, and the state governments support public hospitals. A mixture of state and commonwealth programs fund community care, including allied health services, and individuals can purchase private health insurance, which provides private hospital care and a range of ancillary services (physiotherapy, psychology, podiatry, etc.).

In 1997, Australia's governments began trials of coordinated care to develop and test models of service delivery for chronic conditions (Commonwealth Department of Human Services and Health 1995). The impetus for reform was escalating health care costs driven by an aging population and advances in technology, a shift in emphasis of health care delivery from the tertiary- to the primary-care sector (World Health Organization 2002), and demands by consumers for more patient-centered care.

The principal national hypothesis that the trials were asked to test within a two-year time frame was the following: Coordinating the care of people with multiple service needs, who receive their care through individual care plans and funds pooled from existing commonwealth, state, and joint programs, will improve their health and well-being using existing resources. The main purpose of the trials was to "develop and test different service delivery and funding arrangements, and to determine the extent to which the coordinated care model contributes to

- Improved client outcomes.
- Better delivery of services, which are individually and collectively more responsive to the clients' assessed needs.
- More efficient ways of funding and delivering services" (Commonwealth Department of Human Services and Health 1995).

This article describes SA HealthPlus, which comprised eight projects within four regional subtrials across South Australia and was the largest of Australia's nine national coordinated care trials. Previous publications have summarized the outcomes of the trials (Battersby 2005), and trial elements (Harvey 2001b; Heard et al. 2002; Hurley, Whitford, and Kalucy 2000; Smith et al. 2002). Therefore, the aim of this article is

to highlight the innovative aspects of the generic (not disease-specific) model of care, including the case management role, the model's strengths and weaknesses, implementation issues, and policy implications.

Aim of the SA HealthPlus Trial

SA HealthPlus provided an opportunity to create and test the impact of a fundamental shift in the way that health services are delivered, from a funding-based model to an outcomes-based model. The funding-based model is characterized by fee-for-service, which provides incentives for throughput and reactive care rather than proactive care for chronic conditions, and by a provider-focused, fragmented system, in which secondary and tertiary services are oriented toward disease. In an outcomes-based model, the funds provided by both the state and commonwealth governments for all aspects of care for a defined group of patients are used to achieve particular health outcomes. The funding for a range of primary and acute care services is pooled to provide patient-centered, planned, evidence-based coordinated care to achieve individual and population targets.

An outcomes-based system requires an information system to facilitate a continuous learning approach for both managers and clinicians. The major challenge for SA HealthPlus was to create and implement an outcomes-based system within a two-year time frame, in order to realize sufficient savings to cover the costs of coordinating care, provide the necessary preventive services, and fund the required systems changes as well as educate clinicians and administrators to adopt and use such an approach for the care of patients. Almost none of the six elements of the chronic care model (Wagner et al. 2001) were in place at the beginning of the trial.

In effect, two concurrent research trials were conducted, the first directed at the individual level to improve health outcomes and the second at the systems level in order to effect organizational change (Harvey 2001a). The trial was intended to provide new service delivery and funding systems for those South Australians with chronic illness (Blight 1995). The subtrials had broad geographical and clinical attributes. Three were conducted in the southern, central, and western metropolitan areas of Adelaide, the capital of South Australia, and one in the rural Eyre Peninsula region. The four subtrials contained

eight projects: southern (somatization, aged care, chronic obstructive pulmonary disease [COPD]), central (cardiac), western (type 2 diabetes, COPD), and Eyre (chronic and complex, and type 2 diabetes).

The Coordinated Care Intervention

The trial addressed the hypothesis in two parts, whether patient outcomes could be improved and whether this could be done with the existing resources. The model of care was intended to reduce the complications of illness by prospective, preventive care planning and to reduce or delay disabilities and handicaps by helping patients achieve their goals. These two elements were designed to lead to "improved health and well-being." Achieving this with the existing resources depended on preventing unplanned hospital admissions and using the funds saved to pay for coordination and preventive services.

The SA HealthPlus model addressed different coordination issues in separate but linked sets of strategies. Those strategies to bring all the medical costs for a group of patients under one fund and then to reallocate them (funds pooling) addressed the undersupply of necessary primary services and the acute demand for tertiary services. Those strategies regarding the structured care plan addressed reactive crisis care for chronic illness and the lack of communication among providers. Finally, those strategies relating to patient-centered care addressed the previous providers' focus and fragmentation of services.

Funds Pooling

Funds were contributed to the funds pool by public hospitals (inpatient services), the Medical Benefits Schedule (MBS; doctors' visits, investigations, and procedures), Pharmaceutical Benefits Schedule (PBS; subsidized approved medications), Department of Veterans Affairs, and regional domiciliary services (home care for older people provided by community nurses and allied health organizations).

The Care Plan

The care plan was designed to be a global summary of the patients' planned care for twelve months, a motivational tool, a measure of

outcomes over time, and a communication tool. It provided a record of demographic details, including details about the patients' partners or community caregivers, health service providers, diagnoses, investigation results, medications, services planned, and services received. To break down barriers to coordination, all providers had to use a common care plan, which contained a twelve-month overview of the planned care, including the patients' self-defined problems and goals. The care plan complemented each provider's detailed management plan. The process of creating the care plan was designed to involve the patients in their own care and to begin the process of behavioral change to improve their self-management of their chronic condition.

Care Planning: Patient-Defined Problems and Goals (P&G). Using the patients' perception of their main life problem signified a fundamental shift in individual health management from the focus on disease to one on the patient and the problem. The problems and goals (P&G) approach was based on a semistructured interview developed in the mental health field (Fox and Conroy 2000; Marks 1986; Marks et al. 1977; Richards and McDonald 1990) emphasizing motivation and behavioral change by first defining the patients' (life) problems and then their goals, rather than the more commonly used provider-generated list of goals. The patients' perception of the impact of their chronic condition(s) was at the forefront of care planning (Battersby et al. 2001). The problems' severity and goal achievement were rated on a 0-to-8 scale (with 8 = severe problem and 8 = no progress toward the goal) by both the patient and the health care provider, so that care planning could be patient-centered, holistic, outcome-based, and motivational (Battersby et al. 2001). The P&G assessment was completed as part of the initial assessment after the patients were enrolled in the intervention group, as the first step in helping the patients improve their self-management. The GPs and other health workers were able to use the patients' goals to encourage their adherence to their medical management.

Care Planning: Evidence-Based Guidelines. The clinical guidelines for each project were developed by multidisciplinary groups, which defined a set of criteria and associated preventive services for each of three levels of severity for the relevant disease or condition. The groups agreed on the minimal frequency of these services over a twelve-month period, emphasizing the prevention of medical complications and hospital admissions.

Hospital admissions that were preventable were identified from hospital discharge data, resulting in a list of preventable diagnosis-related

groups (DRGs) for each principal disease. To satisfy the hypothesis's financial component, each project was given a target of reducing preventable admissions by 50 percent compared with those of the control group. In this way, the two components of the primary hypothesis were brought together; that is, a mechanism was created to improve outcomes with existing resources if hospital savings could be used to buy more effective coordination and preventive primary care services. Together with the GPs' medical assessment and the service history of the previous twelve months, the patient's P&G statement contributed to a structured twelve-month care plan developed by GPs, service coordinators, and patients. The GPs were paid a fee to develop each care plan as well as an annual fee to oversee their patients' care and were supported by service coordinators, who were employed in all trial sites. The SA HealthPlus staff monitored the patients' outcomes in regard to service use, P&G (0–8) ratings, and health status measures throughout the trial and provided this information to each patient's GP. This process supported the commitment to continuous improvement that was a cornerstone of the SA HealthPlus strategy.

Coordination and the Continuous Learning Framework

The roles of service coordinator (SC), GP, and project leader were clearly defined. At the inception of the trial, very few nurses or allied health professionals worked in Australian general practice, for which the GPs provided all patient services. Moreover, the GPs referred patients to other providers in an inconsistent and uncoordinated way. The SCs enrolled the patients, administered trial questionnaires, conducted the P&G assessment, and prepared a draft care plan based on the care plan generator and the current or planned services offered by other health professionals involved in each patient's treatment. The care plan generator provided a guide to the minimum recommended services for the main condition over a twelve-month period. The SC arranged an appointment for the patient with the GP, who conducted a medical assessment. Based on this and the GP's knowledge of the patient, as well as the patient's P&G statements, the GP and patient agreed on the services, in addition to those recommended by the care plan generator, to be added to the care plan over the next twelve months. Both the GP and the patient signed the care plan, and copies were made for the patient, the

service coordinator, and other providers, with the original retained by the GP.

The SC helped the patient to gain access to and coordinate the community and patient education services. Over the following months, through a combination of face-to-face and telephone contacts, the SC worked with the patient to achieve his or her goals and self-management of the chronic conditions. The SC did not offer disease-specific education, as this was part of the care plan's services. The SC provided a minimal three-monthly verbal or written report of the patient's progress to the GP and had contact with the patient an average of once a month during the trial. At twelve months, each patient received a review of all aspects of the care plan, and a new care plan was prepared for the next twelve months.

The GP oversaw the creation, implementation, and monitoring of the care plan and offered both prospective and as-needed medical management. The project leaders, mostly specialists, supported the GPs and service coordinators by reviewing the care plans and conducting case conferences for complex cases. The project leaders' committee supplied a model of continuous learning and oversaw an annual review of the care plan guidelines using information provided by project-aggregated data and case conferences (Frith et al. 2001). Toward the end of the trial, GPs and specialists experimented with an electronic care plan that included individual patients' service data (Warren et al. 2001).

Training and Supervision

The Coordinated Care Training Unit (CCTU) was established with mental health nurses who had strong backgrounds in behavioral psychotherapy. The service coordinators, who were mainly registered nurses but also included allied health professionals such as physiotherapists and social workers, initially received two days of training in the trial methodology, care planning, and the P&G approach, followed by a competency assessment and accreditation that was reviewed annually. The CCTU supported service coordinators through individual and group supervision.

Evaluation Methods

The trial evaluation was conducted by an independent local evaluation team (LET) in accordance with the national evaluation framework (Commonwealth of Australia 2001). As well as addressing the primary

outcome measures of health status and resource use, the evaluation acknowledged that the trial involved changes in relationships, responsibilities, planning, and financing for many people and organizations. The evaluation combined extensive quantitative analysis with qualitative approaches, including interviews and focus groups with patients, service coordinators and GPs, document analysis, and case studies.

Trial Design

The participating patients meeting the admission criteria were allocated randomly to intervention or control groups (in a ratio of two to one) after enrolling in the southern or central subtrial. It was not possible to blind GPs and service coordinators to the patients' allocation, as the interventions of care planning and care coordination, which they provided, were available only to intervention patients. Some GPs were responsible for caring for patients in both the control and the intervention groups. Geographically isolated control groups were recruited in the northern metropolitan area for the western subtrial, and in the rural Yorke Peninsula for the similarly situated rural Eyre Peninsula subtrial. All enrolled patients' service use was tracked, and the patients also were asked to complete two survey instruments.

Eligibility

Each project group defined its eligibility criteria according to the broad framework of chronic and complex medical conditions requiring high service demand. For most projects, the criteria were a hospital admission in the twelve months before enrollment, more than eight visits per year to the GP, and more than four emergency or "outpatient" (ambulatory) hospital visits in the twelve months before enrollment. As the recruitment progressed, the criterion of requiring prior hospitalization was relaxed to achieve the recruitment targets and also to accommodate some GPs who believed that their complex patients without prior hospitalization would benefit from the intervention. Patients were excluded if they were so medically or mentally impaired that they could not give informed consent, complete survey forms, or carry out trial-related activities.

Patients from the GPs' lists were recruited by letter and phone contact between August and December 1997. The SCs visited the patients at home to enroll and randomize them and to conduct a P&G assessment of those patients in the intervention group.

Sample Size

Cost modeling from historical data of representative samples matching the eligibility criteria for each project before recruitment indicated that preventable admissions accounted for 36 percent of the cost of all hospital admissions. SA HealthPlus aimed to reduce preventable admissions by 50 percent, with a resultant reduction in overall admissions of 18 percent. EPi Info 6 Statcalc (Centers for Disease Control and Prevention 1997) was used to determine the sample size, based on the expected admission rate in the control group during the trial. For example, using a ratio of intervention to control of two to one (95 percent confidence limit, 80 percent power) and a 90 percent admission rate in the controls, the intervention sample size required to detect a 15 percent reduction in intervention admissions was 207. If the admission rate in the controls was 60 percent, the intervention sample size required to detect a 15 percent reduction in admissions was 751.

Outcome Measures

Health and Well-Being

Two instruments were administered to intervention and control group patients in all subtrials (mainly by mail) at enrollment, at twelve months, and at the end of the trial, which was a period of nineteen to twenty-seven months after enrollment.

Self-assessed health status (the SF-36) (Ware and Sherbourne 1992) was used as a generic measure of self-reported health and well-being and had been validated in an Australian population (McCallum 1995; Sanson-Fisher and Perkins 1998). The Work and Social Adjustment Scale (WSAS) (Marks 1985; Mundt et al. 2002) was used as a measure of disabilities and handicaps for all intervention and control groups. The scale asks the client's perception of the impact of his or her main problem in five areas of daily life: work, home management, social leisure, private

leisure, and family and relationships. Each area is measured on a scale of zero to eight. Though quick and easy to use and sensitive to change over time, the scale had not been validated in a chronically medically ill population.

Other specific measures not reported here were used for intervention and control group patients in four projects. The P&G assessment, an essential component of the intervention and therefore used only with intervention patients, also was a key measure of the patients' and service coordinators' perception of goal achievement over time.

Service Use

Enrolled patients consented to having their service use tracked for the two years before their enrollment and for the duration of the trial. Service use data were available (in the absence of unique patient identifiers) for the major areas of service use: medical visits/services, medications, hospital admissions (public and private), metropolitan domiciliary services (allied health daily living support home care), and metropolitan home nursing care. Outpatient hospital data (e.g., outpatient, allied health, accident and emergency) were usually not available owing to multiple incompatible information systems, complicated by the large number of hospitals involved. Data on private allied health and community services also were not available.

Results

Recruitment

In 1997 and 1998, the trial staff recruited 4,603 patients and 295 GPs in the four regional subtrials (see table 1). Between one and ninety patients per GP were recruited. The analysis presented here is based on the regional subtrials, as GPs and service coordinators offered the intervention to more than one project in the region. The central (intervention/control [I/C] 271/138) and southern ([I/C] 887/427) subtrials were randomized by patient, and the Eyre ([I/C] 1353/513) and western subtrials ([I/C] 604/410) used geographic controls.

One hundred service coordinators were trained during the trial, most of whom worked as part of a team based at a single site in each region, with

TABLE 1
Demographic and Health Status Data for Patients in Intervention and Control Groups in Each Subtrial

	Central		Western		Southern		Eyre	
Patient Profile	Intervention	Control	Intervention	Control	Intervention	Control	Intervention	Control
Total number of patients	271	138	604	410	887	427	1353	513
Average age in years (at enrollment)	74	74	67	61	73	74	62	63
Percent males	49.4	51.4	48.2	46.2	42.1	42.9	48.6	48.3
Percent married/de facto	61.6	60.1	62.1	69.8	59.3	54.7	67.3	69.2
Percent health care card holder[a]	82.7	77.5	83.6	75.9	75.2	75.7	47.2	70.1
Percent veterans	12.2	8.0	7.9	5.8	20.4	21.3	7.2	9.9
Average number of days in trial	540	571	529	592	568	615	622	621
Percent attrition from trial	41	49	52	49	38	39	32	41
Number (%) with baseline SF-36 data	234 (86.3)	128 (92.7)	462 (76.5)	363 (88.5)	731 (82.4)	378 (88.5)	1033 (76.3)	488 (95.1)
Number (%) with follow-up SF-36 data	99 (36.5)	57 (41.3)	215 (35.6)	164 (40.0)	417 (47.0)	211 (49.4)	653 (48.3)	351 (48.9)
Baseline SF-36 (PCS)[b]	33.6	33.3	34.7	38.1	34.3	34.5	36.3	35
Baseline SF-36 (MCS)[b]	45.8	45.7	44.4	46.9	46.8	47.9	46.1	46.2

Notes: [a]Individuals are eligible for a health care card if they receive government social security payments, for example, for low-income families, unemployment, disability, and aged pension. Card holders receive government subsidies for medications and doctors' visits.

[b]Scores of baseline SF-36 physical component summary (PCS) and mental component summary (MCS) are significantly below population norms (49.23 and 49.79, respectively) (Butterworth and Crosier 2004).

a small number being based in GP practices. Service coordinators had a caseload of approximately one hundred patients per full-time equivalent position.

Trial Attrition

More than half the patients enrolled (61 percent of intervention patients and 57 percent of control patients) remained in the trial until December 1999. The reasons for attrition were death (5.1 percent of intervention group patients and 5.8 percent of control group patients), dissatisfaction with the trial for a small proportion (2.1 percent of intervention and 1.3 percent of control patients), and "other" for 23.2 percent. Many of the intervention patients in this category stated that they did not want the reason for withdrawal to be recorded as dissatisfaction (Centre for Health Care Evaluation 2000). When reconsent was required in July 1999—because the trial was extended beyond the original date—more control than intervention patients took the opportunity to withdraw. SF-36 data were available for 79 percent of the intervention patients and 91 percent of the control patients at baseline and for 44 percent and 46 percent, respectively, in December 1999.

The Trial's Effects on Patients

The following case study (Centre for Health Care Evaluation 2000) illustrates the impact of the problems and goals approach and the care-planning process in a man with COPD and complex health problems that had been worsening over the last five years:

> *Problem statement:* Shortness of breath, being on oxygen sixteen hours per day, and having to take medication at regular intervals mean that going out is a "real hassle," and therefore I have given up many of my activities. Rated 8 on how much the problem affected his daily activities: 8 = severe interference, 0 = no interference.
>
> *Goal statement:* To recommence attending calligraphy activities/ workshops for one day once per month. (This would be very difficult for this patient because of his dependence on oxygen and his social circumstances.) At the outset, rated 8 on progress toward achieving this goal: 8 = no progress, 0 = complete success.

This patient found that the problems and goals approach allowed him to express his desire to return to a vocational interest and served as a mechanism to reduce his dependency on oxygen to only overnight use. His engagement in the process also meant that the goal was realistic and important, meaning that he was fully committed to achieving it. The patient was also very involved in the care-planning process, which made him think about what was happening to his health and why. This led to recognition of his priorities and increased his motivation. This form of care planning also helped his general practitioner better understand what was important to managing the patient and advising an alternative way of using his nebulizer to enable him to stay off the oxygen longer. The SC was somebody else to talk to without feeling like he was "causing a problem," and the SC was also a significant resource for solving problems and planning appointments or visits outside his home.

As a result, the patient was able to reduce the impact of his problem from 8 to 4 and completely achieved his goal (rated 0 at the end of the trial). These outcomes appear to have contributed to the patient's overall well-being as measured by the SF-36, as he recorded a positive improvement (+21 points) in his Mental Component Summary Score over time.

Health and Well-Being: SF-36 Results

The attrition of both intervention and control patients lowered the completion rates at the end of the trial to approximately half the patients who commenced the trial. Because patients who withdrew completed no further instruments, "intention to treat" analysis was not possible for the SF-36. Little improvement was expected in self-reported health status as measured by the SF-36, as the patients enrolled in these trials were likely to decline rather than improve (Centre for Health Advancement and KPMG Management Consulting 1999; Eagar 1997). As reported previously (Battersby 2005), however, the intervention group in six projects showed significant improvements in at least one domain relative to the control group. The Southern and Western Respiratory Projects showed improvements in mental health domains (mental health, vitality), and the Central Cardiac, Western Diabetes, Eyre Chronic and Complex, and Southern Aged Care showed improvements in both physical and mental domains. The significant differences in SF-36 change scores reflected

higher levels of well-being in the intervention group over time, compared with deterioration in the control group.

Health and Well-Being: The Work and Social Adjustment Scale

Our analysis used four items (0 to 8) of the Work and Social Adjustment Scale and the total score (0 to 32), omitting the "Work" item as irrelevant to most patients in this study. The WSAS was administered by mail with the SF-36 for the control group and by the service coordinator for the intervention group because their scores were used to monitor clinical progress. The patients were not given their earlier WSAS scores. Using the baseline to end of trial mean difference scores, five of the eight projects showed significant improvements for WSAS for the intervention group relative to the control group over time (see table 2).

Health and Well-Being: Problems and Goals (P&G)

The results indicated that up to 60 percent of intervention patients (and their service coordinators) rated their main problem as having improved between the first and final scores (Battersby 2005), with the somatization project having the most patients with higher scores and the cardiac project the fewest. Between 40 and 60 percent of patients made some progress toward achieving their first goal between the first and last set of ratings, which was a period ranging from fifty to seventy weeks in different projects. Up to one-third of patients were further away from achieving their goals at the end of the trial. There were significant ($p \leq .05$) positive correlations between the changes (from baseline to end point) in the P&G scores and the SF-36 scores (Spearman correlations $r \leq 0.12$) and WSAS scores (Spearman correlations $r \leq 0.35$).

Care Coordination

SA HealthPlus implemented a consistent model of care coordination through the four subtrials, combining trial processes (P&G assessment,

TABLE 2
Work and Social Adjustment Scale (WSAS)

WSAS Item: Home, Social, Private, Relationships, Total	Intervention		Control		*Value T*
	Mean	Std Dev.	Mean	Std Dev.	T
Eyre Chronic and Complex					
Social	0.42	2.27	−0.21	2.66	3.13
Private	0.59	2.10	−0.10	2.44	3.72
	($n = 402$)		($n = 226$)		
West Diabetes					
Family	0.49	1.90	−0.13	2.25	2.34
	($n = 128$)		($n = 113$)		
West COPD					
Total	1.24	8.33	−1.19	7.00	1.94
Private	0.27	2.65	−0.47	2.18	(F = 5.14)[a]
Family	1.18	2.36	−0.31	1.91	4.35
	($n = 93$)		($n = 67$–71)		
Southern COPD					
Home	0.61	1.64	−0.57	2.50	2.74
Social	1.22	2.08	−0.54	2.87	3.95
	($n = 74$)		($n = 42$ & 50)		
Southern Aged Care					
Home	0.25	2.08	−0.17	2.37	1.93
Social	0.68	2.18	−0.43	2.50	4.96
Private	0.02	2.35	−0.23	2.35	5.51
	($n = 291$)		($n = 144$–168)		

Notes: Baseline to end of trial mean difference scores for intervention and control groups that were significantly different ($p < 0.05$) (higher score = improved health status).
[a]An analysis of covariance was conducted for the western region to control for the variable age (covariate) because the control group was significantly younger. The significant results of this analysis were reported for nonsignificant t-test results.

care plan, monitoring of plan and goals) and staff (GP and service coordinator). Surveys and case studies suggested that the care coordination function improved the patients' confidence and well-being when they were able to benefit and were engaged in the process, the GPs were fully engaged in the process, the GPs and the service coordinators worked in partnership with patients, and the service coordinators' style was culturally appropriate to both the GP and the patient.

Effects of Care Planning

Patients in the intervention group received the services recommended by the evidence-based care plan developed by their GP, whereas patients in the control group received the services based on the GP's usual care. An analysis of the services received during the twelve-month period of the care plan for the intervention patients and controls over an equivalent time showed that the intervention patients had significantly more lipid tests and bowel cancer–screening tests than did the controls (Heard et al. 2002). Adherence to the care plan depended on the voluntary involvement of the GPs, patients, and service providers as well as the timely availability of services. The service coordinator helped all parties adhere to the plan.

Extent of Benefit

Service coordinators and GPs recognized that some trial patients benefited little if at all. Some enrolled patients did not require the degree of coordination provided, and others needed service coordination for a comparatively short time because their services were already well coordinated, they were motivated and well supported, and their health conditions were stable. The service coordinators estimated that about 25 percent of their patients made major improvements in well-being. They determined that the patients who benefited most were living in difficult situations, were not previously linked into health and community services, lacked knowledge of their condition and available services, were depressed, had no motivation to change their behavior, had lifestyle risk factors (e.g., diet, weight, smoking, alcohol), and/or had poorly controlled conditions characterized by hospital admissions. Interviews with their GPs confirmed these conclusions.

Self-Management

An unanticipated consequence of the SA HealthPlus trial was the development of the Flinders Model of Self-Management Support (Regan-Smith et al. 2006). A midtrial review of the model of care with the service coordinators found that the P&G approach was a successful method of implementing patient-centered care and initiating behavioral change. However, the service coordinators were allocating coordination time according to their perception of the patients' self-management

capacity rather than their conditions' severity, as the model of care intended. For example, patients with several comorbid conditions, multiple medications, and high disability may have needed little service coordinator time because they were good self-managers, had excellent family support, and shared their decisions with their GP. As a result, at the end of the trial, the CCTU at Flinders University experimented with an objective method, the Partners in Health Scale and Cue & Response Interview (Battersby et al. 2003), to assess self-management capacity and incorporate this into the care-planning process. The Flinders Model of Self-Management Support has since served as a training program to more than two thousand clinicians across Australia.

The Trial's Effects on Service Use

We analyzed hospital inpatient data regarding total number of admissions, emergency admissions, and elective admissions per time in trial using an "intention-to-treat" basis, that is, including (with permission) data from those patients who withdrew from the trial and data on those who completed the trial. Combining all subtrial data, hospital inpatient usage accounted for 52 percent of the cost of all services. We analyzed the differences between the intervention and control groups in admissions per trial day using Poisson regression, adjusting for past service use.

Although the results indicated no significant change in inpatient hospital admissions in the randomized southern or central regions, the two regions employing geographic controls showed effects but with contrasting results. The Eyre trial recorded a reduction in admission rates in the intervention group compared with the control group, mainly reflecting an increase in emergency admissions in the control group for the chronic and complex project. The western trial showed an increase in admission rates in the intervention group, mainly due to an increase in elective admissions in both the diabetes and respiratory projects compared with the northern suburbs control groups.

Overall, there was no substantive change in the intervention group's and the control group's use of the Medical Benefits Schedule (MBS; medical attendances and investigations) or the Pharmaceutical Benefits Schedule (PBS; subsidized approved medications) over the course of the trial, although in the somatization project, there was a 45 percent reduction in PBS (drug) use in the intervention group compared with the controls. For those domiciliary (community allied health) services

for which data were available, intervention patients used more services than the controls did, as they had better access to services as a result of their coordination.

Resource Use

Accurately estimating the usual cost of care proved to be difficult, especially for projects with geographically isolated controls. Even though geographically isolated control group patients were matched according to project eligibility criteria, they differed in their use of services in the two years before the trial, partly because of regional differences in service access and availability. We therefore adjusted the service use data for differences between the intervention and control groups in the two years before the trial. Thus, for example, if the costs for the hospital inpatient intervention group were 30 percent above those of the control group in the two years before the trial, we raised the control group's costs by this percentage for the "live" phase. Table 3 shows the adjusted differences in all service use categories for the intervention and control groups for each subtrial as the cost per patient per day on trial.

From these analyses of service use data to the end of October 1999, combining all subtrials and all costs, the intervention group showed a deficit of AUS$4,842,898 (adjusted) compared with the amount for the control group (usual care). Any savings in admissions to acute care did not compensate for the coordination costs and additional community services.

Targeting Enrollments

In order to meet enrollment deadlines and quotas, the criterion for a hospital admission before enrollment was relaxed to include patients that clinicians considered to be at risk of hospital admission. As a result, only 58 percent of the enrolled patients had at least one hospital admission before their enrollment (71 percent of central cardiac to 43 percent of Eyre Peninsula diabetes), and 51.7 percent had a hospital admission during the live phase. This therefore reduced the population's potential hospitalization base from which the savings could be generated. One of the effects of this change in entry criteria was that many enrolled patients had less need for coordination than anticipated. Table 4 shows the costing

TABLE 3
Comparison of Cost per Patient per Active Day on Trial between Intervention and Controls, Adjusted for Historical Service Use

	Control				Intervention			
Subtrial	Number of Active Days on Trial	Number of Services	Expense (AUS$)	Cost Per Patient Per Active Day (AUS$)	Number of Active Days on Trial	Number of Services	Expense (AUS$)	Cost Per Patient Per Active Day
Eyre								
MBS (medical services)	281,086	15,664.00	558,887	1.99	684,402	35,360.00	1,156,312	1.69
PBS (medications)	281,086	23,727.00	555,992	1.98	684,402	56,944.00	1,338,531	1.96
Veterans	281,086	2,290.00	195,360	0.70	684,402	1,799.00	118,164	0.17
Hospital inpatient	281,086	897.27	1,820,614	6.48	684,402	1,960.83	4,058,552	5.93
Hospital outpatient	281,086	63.00	3,654	0.01	684,402	37.00	2,296	0.00
Other	281,086	10.00	370	0.00	684,402	4,174.00	147,613	0.22
Subtotal			3,134,878	11.15			6,821,469	9.97
South/central[a]								
MBS (medical services)	300,380	24,901.00	817,462	2.72	546,747	47,314.00	1,579,116	2.89
PBS (medications)	300,380	26,275.00	546,107	1.82	546,747	44,959.00	957,582	1.75
Veterans	300,380	2,003.00	83,427	0.28	546,747	8,171.00	428,315	0.78
Hospital inpatient	300,380	690.48	1,421,987	4.73	546,747	1,396.22	2,946,586	5.39
Hospital outpatient	300,380	273.00	16,849	0.06	546,747	850.00	53,070	0.10
Other	300,380	5,041.00	53,872	0.18	546,747	8,918.00	155,289	0.28
Subtotal			2,939,704	9.79			6,119,959	11.19
Western								
MBS (medical services)	214,727	16,403.00	555,801	2.59	236,359	22,676.00	712,236	3.01
PBS (medications)	214,727	17,701.00	391,363	1.82	236,359	24,177.00	564,507	2.39
Veterans	214,727	330.00	33,480	0.16	236,359	2,567.00	162,325	0.69
Hospital inpatient	214,727	458.61	975,658	4.54	236,359	859.66	1,874,480	7.93
Hospital outpatient	214,727	51.00	3,498	0.02	236,359	659.00	46,562	0.20
Other	214,727	1,017.00	16,206	0.08	236,359	4,957.00	71,156	0.30
Subtotal			197,6005	9.20			3,431,266	14.52

Note: [a]Central was combined with southern because of small sample size. "Hospital outpatient" refers to emergency department and ambulatory attendances. "Other" indicates community allied health services and home nursing services. Both "hospital outpatient" and "other" service data were complete only for the southern subtrial.

TABLE 4
Comparison of Savings/Deficits (Adjusted) of Intervention and Control Groups

Subtrial	Hospital Inpatient Intervention-Control Cost Differences, Adjusted (AUS$)	Percent Difference Intervention-Control	Hospital Inpatient (12-Month Patients)[a] Intervention-Control Cost Differences, Adjusted (AUS$)	Percent Difference (Intervention-Control)	Costs of Coordination[b] (AUS$)	Costs of Coordination[b] (12-Month Patients)[a] (AUS$)
Eyre	+447,990	+9.6	+965,283	+24.2	2,027,511	1,153,290
South[c]	−479,920	−18.6	−213,700	−10.1	1,735,009	958,272
West	+270,243	+12.2	+312,275	+17.3	1,009,716	455,712

Notes: [a]"12-month patients" indicates selecting only those patients who had an admission in the twelve months before enrollment.
[b]This includes recruitment, care-planning, and coordination costs.
[c]Includes central cardiac because of small sample size
+ indicates a saving and − a deficit in costs for the intervention group compared with the control group.

data from the analysis of those intervention and control patients having at least one admission in the twelve months before enrollment.

Combining the savings from hospital admissions for all subtrials for the "twelve-month" group changed the net savings in the hospital sector from AUS$252,584 (2.7 percent) to AUS$958,470 (12.2 percent), closer to the 18 percent on which the cost-neutrality modeling was based. Similarly, the overall deficit fell from AUS$4.8 million to AUS$1.7 million, demonstrating the importance of appropriately targeting a particular patient group for coordinated care. The reduction in the overall deficit was generated not only from greater hospital savings but also from the substantially lower costs of coordination.

Which SA HealthPlus Patients Were Most Likely to Have Hospital Admissions?

A major assumption of the trial was that coordinated care could reduce unplanned admissions to pay for substituted services. Predictors of unplanned admissions were determined by using data on admissions for the two years before coordination and during the intervention phase. We used an intention-to-treat approach (including those who withdrew during the trial) and chi-squared automatic interaction detector (CHAID) analysis (SPSS Inc. 1997) for all 4,603 patients enrolled in the trial. The predictor variables were gender, age group, marital status, language spoken at home, employment status, type of pension received, retirement status, health care card status, veteran status, need for a caregiver, ownership of private health insurance, number of comorbidities, and number of hospital admissions during the historical period. The greatest predictor of unplanned admissions was a history of three or more hospital admissions in the previous two years. This group accounted for 24 percent of the patient population and had a 33 percent chance of one or more unplanned admissions per year. Within this group, the greatest probability of unplanned admissions was for those who also had four or more comorbidities.

Discussion

In regard to the national trial hypothesis, the first element of "improved individual client health and well-being" was achieved, as indicated by the improvement in some domains of the SF-36 in six out of eight

projects. The SF-36 results are supported by WSAS data. We were not able to determine precisely which trial components were associated with improvements in well-being. The LET concluded that addressing the fragmentation of care through the patient-centered approaches of P&G monitoring and service coordination in partnership with GPs was a more successful strategy for SA HealthPlus than was the structured care plan or funds-pooling strategies.

There are no agreed-on definitions of the various models aimed at improving chronic illness care such as disease management, case management, and coordinated care (Chen et al. 2000). But using a broad definition of disease management, Weingarten and colleagues (2002) found in a meta-analysis that patients' education, providers' education, and feedback were the most commonly used interventions. SA HealthPlus added to the evidence that incorporating a psychological and behavioral component rather than just a focus on disease was an important element of coordinated care.

The P&G approach and the service coordinators' associated motivational skills enabled the patients to be at the center of the GP–service coordinator interactions. This approach was supported by a review of successful coordinated care interventions by Chen and colleagues (2000), although the patient's life problem rather than a disease-specific problem was not used in previous trials. Using the patient's problem engages the patient in his or her own care and determines whether issues other than health are a priority. The P&G approach works at an individual level, but the trial also showed that aggregated scores can measure the progress of a group of patients over time and that the degree of goal change can be used to monitor the success of a program of care. The approach also enables the practitioners' competence in behavioral change techniques to be supported and monitored.

The greatest lesson that emerged from the trial was that coordination should be provided according to the patient's self-management capacity, not just the severity of his or her disease; that is, self-management capacity may provide a method of determining who requires coordinated care. The Flinders Model of Self-Management Support has become the basis of chronic disease self-management education for health professionals in the National Sharing Health Care demonstration projects (Australian Government Department of Health and Ageing 2004). This care-planning approach is generic and can be applied to a range of conditions and more than one condition in the same patient. For instance, it has been applied in mentally ill patients and resident training in the United States

(Lawn et al. 2006; Regan-Smith et al. 2006). The commonwealth, states, and territories have announced a AUS$500-million strategy to address chronic illness in Australia, of which education of clinicians in self-management support is a key component (COAG 2006).

Cost Neutrality

No money was saved to pay for coordinated care, although the assumptions underpinning the evaluation did not reflect the reality of conducting such an ambitious trial. The costs attributed to "coordination" are largely those of service coordination. Service coordinators had three overlapping roles as clinicians, research officers, and change agents. Accordingly, an accurate cost comparison with "usual care" would require the time that the service coordinators spent developing the tools and processes, collecting data, conducting research, trial administration, and managing change to be separated from that they spent on their purely clinical role. What we did discover is the considerable cost of facilitating system change (Harvey 2001a). Further research on coordinated systems of care should try to disaggregate the costs of change management and research from those of providing care.

In addition, we had no explicit decision-making process to link the care plan's designated services to the anticipated savings from service substitution and fewer hospital admissions. The savings that were generated were automatically absorbed into the costs of providing both coordinated care services and allied health services to everyone in the trial.

A number of coordination programs and health service reforms have described the failure to reduce hospital admissions significantly. In the United Kingdom, Coulter found little evidence that developments in primary care were reducing the demand for secondary care. The general practice fund-holding scheme led to investment by fund holders in new practice-based services without lowering the demand for specialist care, rates of outpatient referral, or hospital admissions. Furthermore, improvements in primary care may increase demand because new needs are identified that previously would not have been met (Coulter 1995, 1996). In the United States, managed care for Medicaid beneficiaries resulted in greater satisfaction, but despite financial incentives to restrict services, there were no differences between the intervention and control groups in their overall use and costs of resources (Sisk et al. 1996). Similarly, a review of disease management programs by Bodenheimer,

MacGregor, and Stothart (2005) noted the disease management companies' problem of carving out populations who would deliver cost savings. There was little evidence that the programs both improved health outcomes and reduced costs.

Other reasons for the trial's inability to achieve cost neutrality were, first, that implementing the care plan required adherence by GPs, patients, and other service providers, as well as the availability and accessibility of all necessary services. Second, it is doubtful that complications would have been reduced sufficiently in the trial's time period to bring about the necessary changes in demand and therefore in hospital admissions. Third, an unintended consequence was an increase in service use mediated by a thorough assessment, identification of needs through home visits by service coordinators, the patients' greater awareness of services, the planned preventive services, and past underservicing in some areas.

The fourth factor was patient selection. The trial demonstrated the need to select patients who needed better coordination of health services and were willing and able to use this model of care. Those patients most suitable to contain costs (e.g., those with at least three hospital admissions in the previous two years) were not necessarily the same group that was most likely to benefit in terms of improved health and well-being. A suggested model would be to limit service coordination to six months. The patients would remain in the care of their primary care team, which would follow up on the changes made through the addition of coordination and self-management support.

Strengths and Weaknesses of the Model

The strengths of this model of coordinated care were the generic components of assessment, the care plan generator, and the care plan, which were applied across many diseases with a range of medical and psychiatric comorbidities, in different populations and regions. The model was feasible for and acceptable to both providers and patients. The P&G component was integral to the model, providing a patient-centered approach that added a psychosocial dimension to care planning and assisted motivation and self-management. A core strength was the role of the service coordinator providing assessment, coaching, communication, and change management across all aspects of the trial. The "discovery" of

the importance of self-management capacity in determining eligibility for coordinated care and developing a method to assess and target self-management interventions for the individual was central to the model's continuous improvement aspect.

Weaknesses of the model included the indirect link among care planning, coordination and savings from reduced hospitalization, and an inability to target coordination to those who would benefit. Once allocated to coordination, there was no mechanism to stop providing coordinated care, which meant that some intervention patients received unnecessary coordination throughout the trial.

Limitations

Overall, the Australian coordinated care trials were intended to test the effectiveness of a new system of health service delivery within the constraints of a controlled trial and with a rigid hypothesis-driven national evaluation framework. The many evaluation challenges included variable selection and eligibility criteria that were relaxed during the recruitment period, variable disease severity, variations in the extent of coordination available in different areas, and widely different contexts for the four subtrials. In some subtrials, the same GP cared for both intervention and control patients. The "black box" effect of the model of care made it difficult to attribute benefits of the intervention group to a particular component of the intervention package.

The trial cohort included patients who were seriously ill as well as those who were not very ill, yet the same intervention processes were used for all of them. Furthermore, hospitals had no incentive to participate in the coordinated care process, as they continued to be funded on a throughput basis and any reduction in admissions for "in trial" patients simply meant that more hospital places were available for "out of trial" patients. The hospital savings could not be "cashed out" because this would have eroded the hospitals' funding base.

The variation in patient selection did enable analyses demonstrating that in a short time frame of two years, the coordination process may have been cost-effective for those with a history of hospital admission and comorbidity. In contrast, in one to two years, the patients' quality of life could be improved for a wider range of disease severity and service use. Because care-planned patients received more preventive services

than control patients did (Heard et al. 2002), potential gains in survival, quality of life, and financial costs could be achieved over the longer term.

The trial indicated that over time, GPs became increasingly familiar with the care-planning process, but the intervention was not in place long enough for its full implementation. The GPs needed reminders to order the services scheduled on the care plan. The patients' adherence was affected by access, distance, understanding, motivation, and cost. Other service providers were hindered by a lack of awareness of the care plan and budget constraints. Purchasing services through SA HealthPlus was limited by the extent of services included in the funds pool. The service providers' communication difficulties were addressed to some extent through the SA HealthPlus information system, but the completeness, timeliness, and usefulness of the information were limited by the lack of electronic links with GPs and the few GPs with computers at the start of the trial.

Policy Implications

The coordinated care trials were successful in beginning the systems and culture change necessary for a preventive chronic care model in Australia. Examples of subsequent system change include the introduction in 2005 of new chronic care MBS item numbers for GPs to fund GP management plans (AUS$120) and team care arrangement (AUS$95), as well as several allied health services to support the care-planning process (Australian Government Department of Health and Ageing 2005). The commonwealth government also has appropriated money to employ practice nurses in rural and remote areas and a program to implement a national health information system (Australian Government Department of Health and Ageing 2006). The National Sharing Health Care demonstration projects (Australian Government Department of Health and Ageing 2004) have tried out models of self-management (PricewaterhouseCoopers 2005). These policy directions have been supported by all governments' commitment to the National Chronic Disease Strategy and its four elements: (1) prevention, (2) early detection and intervention, (3) integration and coordination, and (4) self-management support (COAG 2006).

A key policy implication is that coordinated care is best provided by a team, not an individual physician. When care is preventive and

planned, most of the tasks can be carried out by nurses and allied health professionals, with the physician responsible for medical care. This frees the GPs to concentrate on more clinically demanding tasks and more complex patients. The World Health Organization named nine system elements essential to redesigning care for chronic illness (Epping-Jordan et al. 2001). In Australia, a change in business processes in general practice is required to facilitate a shift from reactive to preventive care.

Health reform has inherent personal, political, and financial risks, often requiring "hump" funding to try out new models of care and institute changes in systems and attitudes (Harvey 2000). During the trial, a change of state government led to a loss of momentum for chronic illness health reform and dismantling of the trial management team. A new state government in South Australia instituted the Generational Health Review in 2003, which identified the same factors that led to the SA HealthPlus trial in 1997. The review identified a need to integrate care for chronic illness, enhance primary care networks, and implement self-management programs (South Australian Department of Human Services 2003). Second-round national coordinated trials are now being evaluated.

Conclusions

The SA HealthPlus trial of coordinated care demonstrated that the individual health and well-being of some patients with chronic and complex conditions can be improved through patient-centered care involving GPs working with a service coordinator and using the P&G approach and a structured evidence-based care plan. The two-year trial was not able to demonstrate a sufficient reduction in hospital admissions to pay for the costs of coordinated care. A longitudinal study is required to better assess individual health changes and the effects of service substitution on costs and hospitalization rates when multiple strategies at the individual and system levels are introduced in a short time frame.

Service coordination was found to be a necessary additional role to that currently available in the health system. Being able to cross all health-sector boundaries and utilize behavioral change skills proved to be critical to the trial's benefits. Better targeting of coordinated care, primarily those with prior hospitalizations and those able to improve their self-management were major lessons of the trial. These findings contribute

to the emerging knowledge of the core components of coordinated care for patients with chronic and complex health needs.

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